Applications of Polyelectrolyte-Micelle Complexes to Environmental Clean-up

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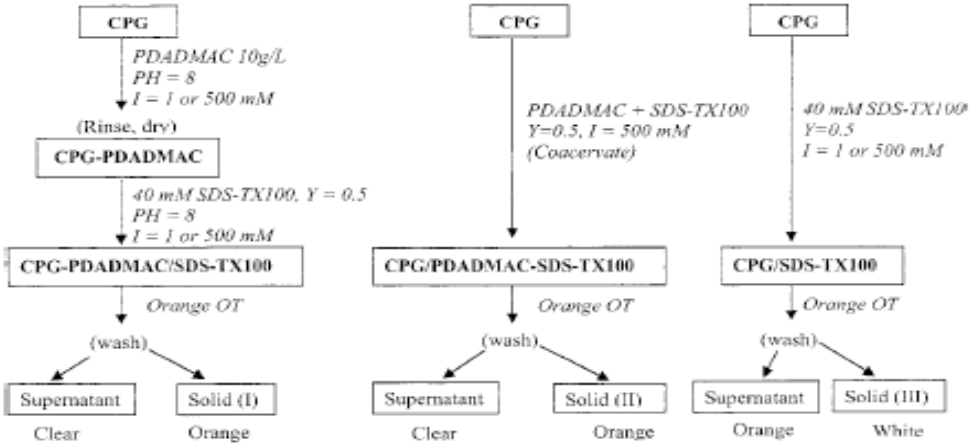
When polyelectrolytes complex to oppositely charged mixed micelles, micelle structure is unperturbed, as evidenced by the retention of solubilizing power[1], and also supported by Cryo-TEM images[2].This gives rise to the interesting possiblity of immobilizing micelles, through electrostatic interactions, namely using a cationic polymer to "glue" micelles to siliceous surfaces, thus achieving an immobilized detergent that can absorb organic pollutants. This hypothesis was first tested by observing the uptake of an oil-soluble dye on porous glass[4], using the procedure shown below.



1. J. Colloid Interface Sci., **142**, 512 (1991)
2. J. Colloid Interface Sci., **186**, 419 (1997) (with M. Swanson, M. Almgren and Y. Li).
3. Chemistry in Brittain, June 2002.

Organic pollutants appear in aqueous solution or suspension in many ways: for example, heribicides in agricultural runoff, storage petrochemicals leaks that migrate with the aquifer, enormous volumes of contaminated brine for off-shore drilling, or discharge into rivers and streams. Remediation costs are vast, and technology primitive.

As inexpensive and practical way to remove may organic pollutants would be to immobilize detergency on sand. In the demonstration here[4], polycation-micelle-treated sand is sandwiched between untreated sand layers, and the trapping of a hydrophobic dye is clearly seen. Current work indicates similar efficacy for "real" pollutants (VOCs).

URE 1. Trapping of an organic solution (Orange OT dye) onto lycation-micelle-treated sand.

4 *Environmental Science and Technology,* **35** 2608 (2001)